

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TIMOTHY SCOTT CHAMBERLAIN,
MICHAEL J. MACDONALD and MARK P. MURRAY

Appeal No. 2005-1189
Application 09/819,787

ON BRIEF

Before WARREN, OWENS and PAWLIKOWSKI, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

Decision on Appeal

This is an appeal under 35 U.S.C. § 134 from the decision of the examiner refusing to allow claims 19 through 31 and 33 through 39 as amended subsequent to the final rejection, which are all of the claims in the application.

Claim 19 illustrates appellants' invention of a method for polishing both metal and dielectric material at substantially the same polishing rate, and is representative of the claims on appeal:

19. A method for polishing both metal and dielectric material at substantially the same polishing rate, comprising:

providing on said metal and dielectric material a slurry comprising abrasive particles and an oxidizing agent wherein said oxidizing agent has a static etch rate on metal of less than 1000Å per hour; and wherein the pH of the slurry is about 5 to about 11;

and polishing said metal and dielectric material by contacting it with a polishing pad.

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U.S. PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS
AND INTERFERENCES

The references relied on by the examiner are:

Wang et al. (Wang)	5,770,103	Jun, 23, 1998
Sakatani et al. (Sakatani)	5,804,513	Sep. 8, 1998

We rely on the following reference of record in entering a new ground of rejection under 37 CFR § 41.50(b) (September 13, 2004):

Ronay	5,968,280	Oct. 19, 1999
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The examiner has advanced the following grounds of rejection on appeal:

claims 19 through 24, 26, 27, 33, 37 and 38 stand rejected under 35 U.S.C. § 102(b) as anticipated by Wang (answer, pages 3-4);¹ and

claims 19 through 25, 28 through 31, 34 through 36 and 39 stand rejected under 35 U.S.C. § 102(b) as anticipated by Sakatani (answer, pages 3-6).

Appellants state that the appealed claims “stand or fall together” (brief, page 3). Thus, we decide this appeal based on appealed claim 19. 37 CFR § 1.192(c)(7) (2003); *see also* 37 CFR § 41.37(c)(1)(vii) (September 2004).

We reverse both grounds of rejection and accordingly, the decision of the examiner.

Under the provisions of 37 CFR § 41.50(b) (September 2004), we enter a new ground of rejection of claims 19 through 27 and 33 through 39 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Wand, Sakatani, and Ronay. *See In re Eynde*, 480 F.2d 1364, 1370-71, 178 USPQ 470, 474-75 (CCPA 1973).

Rather than reiterate the respective positions advanced by the examiner and appellants, we refer to the answer and to the brief for a complete exposition thereof.

Opinion

In order to consider the examiner’s grounds of rejection, we must first interpret the language of appealed claim 19 by giving the terms thereof the broadest reasonable interpretation in light of the written description in the specification as interpreted by one of ordinary skill in the art, without reading into the claims any limitation or particular embodiment disclosed in the specification. *See, e.g., In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Zletz*, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). Claim 19 is

¹ The statement of this ground of rejection in the answer includes claim 32 which was canceled by appellants (brief, page 2).

drawn to a method for polishing both metal and dielectric material at substantially the same polishing rate comprising at least (1) applying to metal and dielectric material a slurry comprising at least some amount, however small, of silica abrasive particles and some amount, however small, of any oxidizing agent that has a static etch rate on metal of less than 1000 Å per hour, wherein the pH of the slurry is about 5 to about 11, and (2) polishing said material by contacting the same in any manner with a polishing pad. The open-ended and transitional term “comprising” opens claim 19 to polishing methods which contain additional steps and materials, including slurries that contain additional ingredients, including additional oxidizing agents which have a greater static etch rate than the rate for the oxidizing agent specified in the claim to the extent that the preambular limitation we discuss below is complied with, there being no limitation establishing the static etch rate for the claimed slurry as a whole. *See generally, Exxon Chem. Pats., Inc. v. Lubrizol Corp.*, 64 F.3d 1553, 1555, 35 USPQ2d 1801, 1802 (Fed. Cir. 1995) (“The claimed composition is defined as comprising - meaning containing at least - five specific ingredients.”); *In re Baxter*, 656 F.2d 679, 686-87, 210 USPQ 795, 802-03 (CCPA 1981) (“As long as one of the monomers in the reaction is propylene, any other monomer may be present, because the term ‘comprises’ permits the *inclusion* of other steps, elements, or materials.”).

The preambular language “polishing both metal and dielectric material at substantially the same polishing rate” when considered in the context of the claimed invention as a whole, including consideration thereof in light of the written description in appellants’ specification, must be given weight as a claim limitation which characterizes the claimed method in order to give meaning to the claim and properly define the invention. *See generally, In re Fritch*, 972 F.2d 1260, 1262, 23 USPQ2d 1780, 1781 (Fed. Cir. 1992) (citing *Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 896, 221 USPQ 669, 675 (Fed. Cir. 1984)); *Corning Glass Works v. Sumitomo Elec. U.S.A., Inc.*, 868 F.2d 1251, 1257, 9 USPQ2d 1962, 1966 (Fed. Cir. 1989), *In re Stencel*, 828 F.2d 751, 754-55, 4 USPQ2d 1071, 1073 (Fed. Cir. 1987). The term “substantially” appearing in this language is a term of degree, and thus the written description in the specification must either provide a definition for “substantially the same polishing rate” or this term will be given its ordinary meaning. *See Morris*, 127 F.3d at 1054-55, 44 USPQ2d

at 1027; *York Prods., Inc. v. Central Tractor Farm & Family Ctr.*, 99 F.3d 1568, 1572-73, 40 USPQ2d 1619, 1622-23 (Fed. Cir. 1996) (“In this case, the patent discloses no novel use of claim words. Ordinarily, therefore, ‘substantially’ means ‘considerable in . . . extent,’ *American Heritage Dictionary Second College Edition* 1213 (2d ed. 1982), or ‘largely but not wholly that which is specified,’ *Webster’s Ninth New Collegiate Dictionary* 1176 (9th ed. 1983).”); *Seattle Box Co., Inc. v. Industrial Crating & Packing, Inc.*, 731 F.2d 818, 826, 221 USPQ 568, 573-74 (Fed. Cir. 1984) (“Definiteness problems arise when words of degree are used. That some claim language may not be precise, however, does not automatically render a claim invalid. When a word of degree is used . . . [it] must [be determined] whether the patent’s specification provides some standard for measuring that degree.”).

In this respect, we observe that the written description in the specification states that the disclosed “[s]lurry compositions . . . are capable of polishing metal and silicon dioxide at the same or at least substantially the same rates, typically at a ratio of polishing rates of metal to silicon dioxide of 1:2 to 2:1 using a soft polishing pad typically used in polishing semiconductors” (page 7, ll. 3-8). On this basis, we find from this general guideline in the specification that appellants use the term “substantially” in the preambular language much more broadly than it is ordinarily defined, *see generally*, *York Prods.*, 99 F.3d at 1572-73, 40 USPQ2d at 1622-23, and indeed, the general guideline indicates that the difference in polishing rates between metal and dielectric material can be somewhat greater than the “typical” ratio of about 1:2 to about 2:1, which ratio is specified in appealed claim 33. *See In re Mattison*, 509 F.2d 563, 564-65, 184 USPQ 484, 486 (CCPA 1975); *cf. In re Marosi*, 710 F.2d 799, 802-03, 218 USPQ 289, 292 (Fed. Cir. 1983) (the general guidelines in appellants’ specification with respect to the term “essentially free of alkali metal” permitted a person of ordinary skill in the art to “draw the line between unavoidable impurities in starting materials and essential ingredients”).

In order to reject the claimed method encompassed by appealed claim 19 under § 102(b),² the examiner must establish a *prima facie* case of anticipation by pointing out where each and

² Appellants amended page 1 of the application on May 8, 2001, to recite that this application is a divisional application of application 09/122,015, filed July 24, 1998. Appellants have not asserted that the grounds of rejection are inappropriately founded on § 102(b) rather than on §§ 102(a) and 102(e), respectively, on the basis of the filing date of the parent application.

every element of the claimed invention, arranged as required by the claim, is described identically in a single reference, either expressly or under the principles of inherency, in a manner sufficient to have placed a person of ordinary skill in the art in possession thereof. *See generally, In re Spada*, 911 F.2d 705, 708, 15 USPQ2d 1655, 1657 (Fed. Cir. 1990).

Appellants submit, *inter alia*, that Wang does not anticipate the claimed method because the reference “suggests employing a slurry having a pH of 1 to about 7” and does not exemplify a slurry with a pH of at least about 5, and that the limitation set forth in the preambular language of appealed claim 19 is not taught by the reference (brief, page 5). Appellants further submit that Sakatani does not anticipate the claimed method because appealed claim 19 was amended to include said limitation that was presented in now cancelled claim 32, which claim was not rejected over this reference (brief, page 9). The examiner finds that Wang discloses the pH of the slurry as “about 1 to about 7 (col. 3, lines 8-12)” and that the addition of a compound to adjust the relative rates of polishing metal and dielectric material with the further adjustment of the pH is optional (answer, pages 3 and 6). With respect to Sakatani, the examiner now argues that the “polishing property of [Sakatani’s] composition inherently teach that the polishing rate of the metal and dielectric material at substantially the same rate because all the processing constituents including the polishing composition are exactly the same as the instant invention” (answer, page 7).

We find that Wang discloses a pH range of “about 1 to about 7” (col. 3, ll. 8-12) and Sakatani discloses ranges of “about 7 or less” and “about 5 or less (col. 3, ll. 61-65). Further, neither reference discloses an illustrative embodiment that falls within the slurry specified by appealed claim 19 as we have interpreted this claim above. Thus, the claimed slurry of appealed claim 19 is not identically described in either reference within the meaning of § 102(b) on the basis of the pH of the slurry alone because the claimed pH range and the pH ranges of each of the references overlap. *See Titanium Metals Corp. of Am. v. Banner*, 778 F.2d 775, 780, 227 USPQ 773, 777 (Fed. Cir. 1985) (“[A]nticipation under § 102 can be found only when the reference discloses exactly what is claimed and that where there are differences between the reference disclosure and the claim, the rejection must be based on § 103 which takes differences into

account. D Chisum, *Patents* § 3.02.”).³ Indeed, if the slurry as claimed is thus not identically described in Wang and in Sakatani, then there is no factual basis in either reference for a finding that the preamble limitation of claim 19 is anticipated.

Accordingly, we reverse the grounds of rejection of appealed claims 19 through 31 and 33 through 39 under 35 U.S.C. § 102(b).

The examiner’s decision is reversed.

Pursuant to 37 CFR § 41.50(b) (September 2004), we enter a new ground of rejection of claims 19 through 27 and 33 through 39 under 35 U.S.C. § 103(a) as unpatentable over the combined teachings of Wand, Sakatani and Ronay. We find that Wang acknowledges methods for the chemical-mechanical polishing (CMP) of substrates which can be comprised of, among others, silica, metal, titanium and/or titanium nitride, including adhesion barriers, using conventional electrostatic pads, wherein the rate of the removal of surface material can be determined by pad pressure and/or velocity and the chemical activity of the slurry used (e.g., col. 1). Wang would have disclosed to one of ordinary skill in this art aqueous slurry compositions for use in such methods in which the abrasive particles can comprise one of the oxides alumina, silica, ceria and zirconia, that can be present in amounts up to 15 percent by weight; the oxidizing agent can comprise the common agents including nitrates and iodates, with potassium iodate being preferred; and a substituted phenol having at least one polar functional substituent (cols. 1 and 2). Wang further would have disclosed that the pH of the composition is generally within the range of about 1 to about 7 (col. 3, ll. 8-12). We find that Sakatani would have disclosed CMP methods for substrates which can be comprised of metal, including tungsten, aluminum, copper and titanium, and dielectric material, that use an aqueous polishing slurry composition in which the abrasive particles comprise at least one of aluminum oxide and silicon oxide along with cerium oxide, which can have a mean particle size of about 2 μm or less, that is, 2000 nanometers or less, and an oxidizing agent that can be an iodate, wherein the pH can be

³ We point out that whether the difference in an overlapping range in a process or composition parameter between the claimed invention and a prior art reference renders the claimed invention unpatentable is a question of obviousness under § 103(a). See, e.g., *In re Geisler*, 116 F.3d 1465, 1470, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997), and cases cited therein; *In re Woodruff*, 919 F.2d 1575, 1577-78, 16 USPQ2d 1934, 1936-37 (Fed. Cir. 1990), and cases cited therein.

about 7 or less, and depends on the kind and amount of oxidizing agent (cols. 1-6). Sakatani would have further disclosed that additional additives can be used with an aqueous slurry (col. 6, ll. 19-31).

We find that Ronay acknowledges that it was known to polish surfaces comprised of metals, such as tungsten, aluminum, copper, tantalum, tantalum nitride, titanium and titanium nitride, and dielectric materials using aqueous slurry compositions which can include such abrasives as alumina, silica, ceria and zirconia, and such oxidizing agents as potassium iodate, ammonium cerium nitrate and potassium ferricyanide, wherein a primary slurry can contain alumina at an acidic pH and a secondary slurry can contain silica at a more neutral pH (col. 1, ll. 25-40).

We determine that, *prima facie*, one of ordinary skill in this art routinely working within the combined teachings of Wang, Sakatani and Ronay would have reasonably arrived at CMP methods for metal and dielectric surfaces using aqueous slurry compositions thus taught by the applied references that fall within appealed claim 19, which we have interpreted above, and the remainder of the appealed claims all dependent thereon, when the prior art polishing slurry compositions have a pH of about 5 to about 7. In this respect, slurries thus taught by the references that contain materials in addition to abrasive particles, such as the substituted phenol of Wang, and an oxidizing agent satisfying the static etch rate limitation, fall with the claimed slurry compositions because of the transitional term “comprising.”

Indeed, the nitrate, iodate and potassium ferricyanide oxidizing agents disclosed in these references reasonably appear to meet the static etch rate limitation because such compounds are disclosed to do so by appellants (specification, e.g., page 5, lines 5-11; cf. page 7, lines 27-28), and so claimed in this respect in appealed claims 22 and 23. Furthermore, because the claimed aqueous slurries and the aqueous slurries disclosed by the combined teachings of the references have the same abrasives, oxidizing agents and pH, the slurries taught by the prior art would reasonable appear to satisfy the preambular limitation of claim 19 as we interpreted this language above (*see above* pp. 3-4), even though Wang, Sakatani and Ronay do not disclose this property. *See In re Skoner*, 517 F.2d 947, 950, 186 USPQ 80, 82 (CCPA 1975) (“Appellants have chosen to describe their invention in terms of certain physical characteristics Merely choosing to

describe their invention in this manner does not render patentable their method which is clearly obvious in view of [the reference]. [Citation omitted.]”).

Moreover, with respect to the claimed methods encompassed by appealed claims 34 through 37, the combined teachings of Wang, Sakatani and Ronay would have taught that, *prima facie*, the CMP methods disclosed therein can be used in different steps of the CMP process and with different metals and dielectric surfaces, including surfaces having adhesion and diffusion barrier metals. In these respects, Wang would have disclosed that the abrasive particles can be present in amounts falling within the range claimed in appealed claim 21; Sakatani would have disclosed that the abrasive particles can have particle sizes falling within the range of appealed claim 25; and Wang would have disclosed that process parameters, such as those of appealed claim 38, can be determined by one of ordinary skill in the art. Thus, we determine that one of ordinary skill in this art would have reasonably arrived at a workable or optimum range of each of these result effective variables. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) (“[W]here general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.”).

Based on this substantial evidence, *prima facie*, one of ordinary skill in this art routinely following the combined teachings of Wang, Sakatani and Ronay would have reasonably arrived at the claimed methods for polishing both metal and dielectric materials at substantially the same polishing rates utilizing aqueous slurries comprising at least abrasive particles and an oxidizing agent and having a pH of about 5 to about 11, encompassed by appealed claims 19 through 27 and 33 through 39, including each and every limitation thereof arranged as required therein, without recourse to appellants’ specification. *See generally, In re Corkill*, 771 F.2d 1496, 1497-1500, 226 USPQ 1005, 1006-08 (Fed. Cir. 1985); *In re Kerkhoven*, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980); *In re Skoll*, 523 F.2d 1392, 1397-98, 187 USPQ 481, 484-85 (CCPA 1975); *In re Castner*, 518 F.2d 1234, 1238-39, 186 USPQ 213, 217 (CCPA 1975); *In re Lintner*, 458 F.2d 1013, 1015-16, 173 USPQ 560, 562-63 (CCPA 1972); *see also In re Dow Chem. Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531-32 (Fed. Cir. 1988); *In re O’Farrell*, 853 F.2d 894, 903-04, 7 USPQ2d 1673, 1680-81 (Fed. Cir. 1988) (“Obviousness does not require absolute predictability of success. . . . There is always at least a possibility of

unexpected results, that would then provide an objective basis for showing the invention, although apparently obvious, was in law nonobvious. [Citations omitted.] For obviousness under § 103, all that is required is a reasonable expectation of success. [Citations omitted.]”).

In view of the overlap in the pH range between the claimed and prior art polishing slurry compositions, the burden is with appellants to establish the criticality of the claimed range. *See Geisler, supra; Woodruff*, 919 F.2d at 1578, 16 USPQ2d at 1936 (“The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. [Citations omitted.] These cases have consistently held that in such a situation, the applicant must show that the particular range is *critical*, generally by showing that the claimed range achieves unexpected results relative to the prior art range. [Citations omitted.]”).

Accordingly, since we have established a *prima facie* case of obviousness under § 103(a) over the combined teachings of Wang, Sakatani and Ronay with respect to claims 19 through 27 and 33 through 39, the burden of going forward has shifted to appellants to submit argument and/or evidence in rebuttal in this respect. *See generally, In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992); *In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984).

We find no evidence or argument in the brief and reply brief which addresses the overlap in pH ranges between the slurries of the claims and thus the combined teachings of the references would have suggested to one of ordinary skill in this art with respect to our discussion of this issue above. Thus, the burden remains with appellants in this respect.

We are not persuaded of any difference in properties between the slurries used in the methods of the appealed claims and of the prior art by appellants’ arguments with respect to etch rates calculated on slurry compositions disclosed in Wang Examples 1 and 2. We note that the slurries contain potassium iodate which is disclosed by appellants to meet the static etch rate limitation for the oxidizing agent specified in appealed claim 19. We find that slurry no. 3 additionally includes hydrogen peroxide disclosed by appellants to have a higher static etch rate. In this respect, we point out again that the open-ended, transitional term “comprising” opens the slurries of claim 19 to include additional oxidizing agents, regardless of static etch rate, to the

extent that the preambular limitation of this claim is complied with, and appellants' have not established that the polishing rate of the metal and dielectric with these slurries is not "substantially the same" as we have interpreted this claim language above. In any event, we find that none of the slurries involved in Wang Examples 1 and 2 has a pH falling within the overlap area of a pH of about 5 to about 7 between the pH ranges of the claimed and prior art slurry compositions. Thus, we find that the evidence in the Wang Examples 1 and 2 does not provide a "side-by-side" comparison with respect to the claimed invention and the closest prior art. *See generally, In re Dunn*, 349 F.2d 433, 439, 146 USPQ 479, 483 (CCPA 1965) ("[W]e do not feel it an unreasonable burden on appellants to require comparative examples relied on for non-obviousness to be truly comparative. The cause and effect sought to be proven is lost here in the welter of unfixed variables.").

Appellants further submit that Wang would not have had one of ordinary skill in the art to the slurry compositions encompassed by the appealed claims, and "fails to provide the degree of predictability of success of achieving the properties attainable by the present invention needed to sustain a rejection under" § 103(a) (brief, pages 6-7). We cannot agree.

We have again considered the teachings of Wang, Sakatani and Ronay and find that each of these references would have disclosed oxidizing agents encompassed by claims 22 and 23 and disclosed by appellants in the written description in their specification to satisfy the static etch rate limitation for such agent specified in appealed claim 19, as well as abrasive particles for slurries used in CMP methods, and both Wang and Sakatani would have disclosed that such ingredients in an aqueous slurry at a pH of about 5 to about 7 will in fact function in CMP methods for the same metals and dielectric materials as claimed. Thus, on the basis of the identical or substantially identical methods and slurries between the claimed and prior art methods, it reasonable appears that the CMP methods using such aqueous slurries disclosed by the combined teachings of the references would polish both metal and dielectric material at substantially the same rate as claimed even though the references do not disclose this property. *See In re Skoner*, 517 F.2d 947, 950, 186 USPQ 80, 82 (CCPA 1975).

Accordingly, having reconsidered the evidence of obviousness in the combined teachings of Wang, Sakatani and Ronay with appellants' arguments and evidence of nonobviousness which

pertain to the new ground of rejection that we have entered above, we remain of the opinion that the claimed compositions encompassed by claims 19 through 27 and 33 through 39 are *prima facie* obvious over the applied prior art. Thus, the burden of going forward with respect to this ground of rejection remains with appellants. *See generally, Oetiker*, 977 F.2d at 1445, 24 USPQ2d at 1444; *In re Piasecki*, 745 F.2d at 1472, 223 USPQ at 788.

Other Issues

We have not included appealed claims 28 through 31 in the new ground of rejection because the applied references do not disclose a slurry to which is added any amount, however small, of an organic diluent as required by these claims. We note that the “organic solvent” disclosed at col. 4, ll. 56-58, of Sakatani relied on by the examiner (answer, page 5) is used in the preparation of the abrasive particles disclosed in the reference and not in a polishing slurry.

Accordingly, we leave it to the examiner to establish that one of ordinary skill in this art would have used any amount of organic diluent in a polishing slurry for both metal and dielectric material and thus, would have added any amount of such diluent to polishing slurries used in the CMP methods suggested by the combined teachings of Wang, Sakatani and Ronay.

This decision contains a new ground of rejection pursuant to 37 CFR § 41.50(b) (September 2004).

37 CFR § 41.50(b) provides “[a] new ground of rejection shall not be considered final for purposes of judicial review.”

37 CFR § 41.50(b) also provides that the appellant, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of the appeal as to the rejected claims:

- (1) *Reopen prosecution*. Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the proceedings will be remanded to the examiner. . . .
- (2) *Request rehearing*. Request that the application be reheard under § 41.52 by the Board upon the same record. . . .

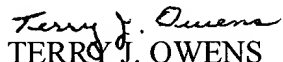
No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a)(1)(iv) (September 2004).

REVERSED

37 CFR 41.50(b)



CHARLES F. WARREN
Administrative Patent Judge



TERRY J. OWENS
Administrative Patent Judge



BEVERLY A. PAWLIKOWSKI
Administrative Patent Judge

BOARD OF PATENT
APPEALS AND
INTERFERENCES

Appeal No. 2005-1189
Application 09/09/819,787

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